Algebra 1 Packet 16

Name____________________

Assigned Teacher_________________

Date_______________

Algebra 1

Behold a new method to solving equations:

The Zero Product Property

The second algebraic technique

$$ab = 0$$

$$\Rightarrow a = 0, b = 0$$

Day	**Homework** (due next class unless otherwise stated)

- Use the Zero Product Property to solve quadratic equations

➢ Standard 14.0

Warm Ups

Circle M T W Th		
Circle M T W Th		
Circle M T W Th		

Warm Ups

Circle M T W Th		
Circle M T W Th		
Circle M T W Th		

The Zero Product Rule

Write all the pairs of integer factors you can find for each of the following numbers. Then write the number of pairs you found.

16	14	19	-50	0
2 and 8 -2 and -8 4 and 4 -4 and -4 16 and 1 -16 and -1 6 pairs	____ pairs	____ pairs	____ pairs	____ pairs

If you tried to write *all* possible pairs of factors for 0, you wouldn't be finished yet. The number of pairs is unlimited! Any number will do for one factor as long as the other factor i 0. This leads us to the Zero Product Rule:

> If a product is 0, then at least one of the factors must be 0.
> Or, in algebraic terms: if $a \bullet b = 0$,
> then $a = 0$ or $b = 0$.

We can use this rule to solve equations like $(x - 3)(x + 2) = 0$. All we need to do is find numbers which make either $x - 3$ or $x + 2$ equal to 0. There are two solutions. Can you see what they are? Finish the table to show that the solutions are 3 and -2.

x	$x-3$	$x+2$	$(x-3)(x+2)$
3			
-2			

Solve each equation using the Zero Product Rule.

$(x-7)(x-2)=0$ $x-7=0$ or $x-2=0$ $x=7$ or $x=2$	$(x-6)(x-1)=0$	$(x+3)(x-3)=0$
$x(x-4)=0$	$3x(x-5)=0$	$5x(x+8)=0$
$(x-2)(x-9)=0$	$(x-3)(x+6)=0$	$(x+1)(x+5)=0$

Quadratic Equations

Equations like $(x-3)(x+2)=0$ are called **quadratic equations**. A quadratic equation can always be written with a second degree polynomial on one side and a 0 on the other side. $(x-3)(x+2)=0$ is equivalent to $x^2-x-6=0$, so it is a quadratic equation.

If we can factor the polynomial in a quadratic equation, we can solve it by using the Zero Product Rule. Here is an example:

$$x^2-8x-20=0$$

First we factor: $(x-10)(x+2)=0$

Then we use the Zero Product Rule: $x-10=0$ or $x+2=0$

Then we find the solutions: $x=10$ or $x={}^{-}2$

To check the solutions, we try them in the original equation.

$$(10)^2-8(10)-20 = 100-80-20=0$$
$$({}^{-}2)^2-8({}^{-}2)-20 = 4+16-20=0$$

Solve each equation by factoring and using the Zero Product Rule.

$x^2-7x+10=0$	$x^2-5x-24=0$	$x^2-10x+9=0$
$x^2+11x+30=0$	$0=x^2+7x-18$	$0=x^2+15x+44$
$x^2-49=0$	$0=x^2-25$	$x^2-100=0$
$x^2-6x=0$	$x^2+4x=0$	$x^2+4x-5=0$

First use the Addition Principle to make one side equal to 0. Then solve the equation by factoring.

To get a 0 here I need to add -2.

$x^2 - 5x + \overset{-2}{8} = \overset{-2}{2}$

$x^2 - 5x - 10 = 4$

$x^2 + 48 = 49$

$x^2 - 6 = 19$

$x^2 + 7x = 8$

$x^2 - 7x = {}^-12$

$x^2 + 7x + 1 = 1$

$x^2 - 10x + 5 = 29$

$x^2 - 5x + 11 = 11$

$x^2 + 16x + 42 = 3$

$x^2 - 10x = {}^-2x$

$x^2 + 3x - 72 = 4x$

$x^2 + 36 = 12x$

$3x^2 - 3x - 8 = 2x^2 + 2$

$x^2 + 5x + 5 = x + 1$

3

26. $d^2 + 2d - 8 = 0$

27. $m^2 - 19m + 48 = 0$

Check:

Check:

28. $z^2 = 18 - 7z$

29. $h^2 + 15 = -16h$

Check:

Check:

30. $24 + k^2 = 10k$

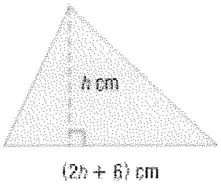
31. $c^2 - 50 = -23c$

Check:

Check:

For exercises 32 and 33, see **Example 5** on page 437.

32. GEOMETRY The triangle has an area of 40 square centimeters. Find the height h of the triangle.



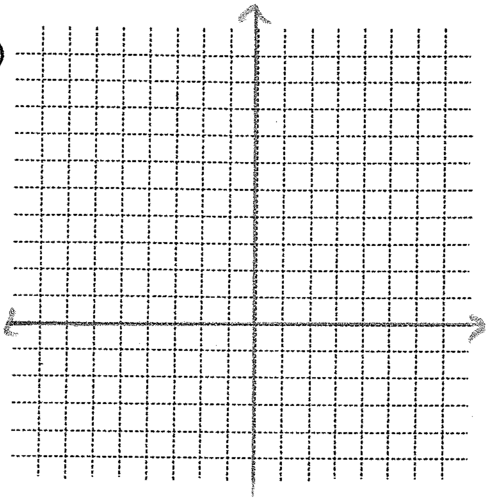
Quadratic Functions

The rule for a **quadratic function** looks like a quadratic equation: $f(x) = ax^2 + bx + c$. The graph of a quadratic function is a curve called a **parabola**. We can graph a quadratic function by plotting points.

Complete the table for each quadratic function. Then draw its graph.

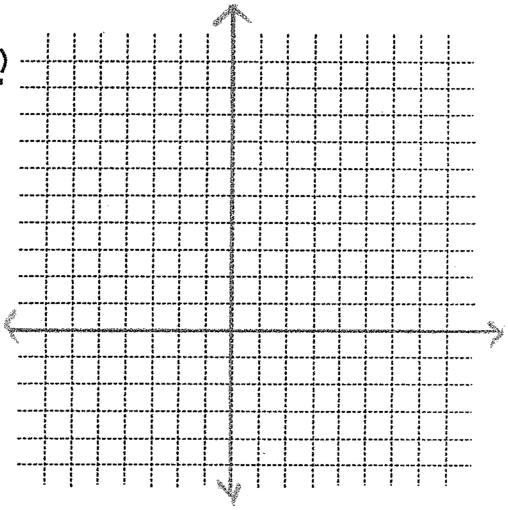
$f(x) = x^2 - 2x - 3$

x	f(x)
$^-2$	
$^-1$	
0	
1	
2	
3	
4	



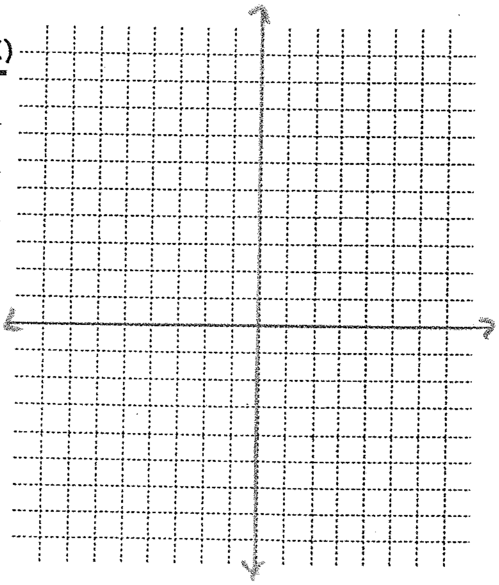
$f(x) = x^2 - 4x$

x	f(x)
$^-1$	
0	
1	
2	
3	
4	
5	



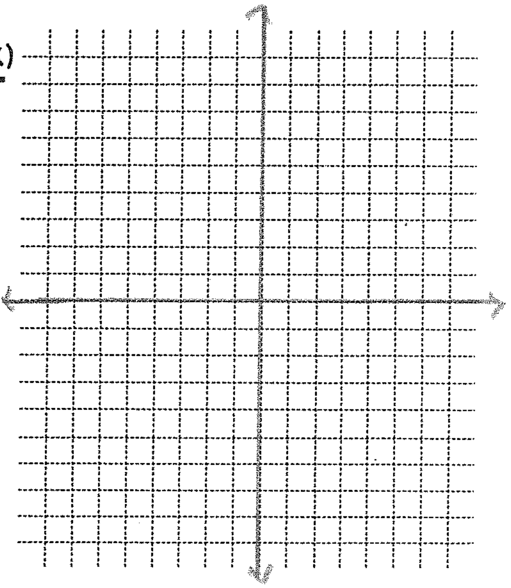
$f(x) = {}^-2x^2 + 10$

x	f(x)
$^-3$	
$^-2$	
$^-1$	
0	
1	
2	
3	



$f(x) = x^2 + 8x + 7$

x	f(x)
$^-8$	
$^-7$	
$^-6$	
$^-5$	
$^-4$	
$^-3$	
$^-2$	
$^-1$	
0	



Did you find it hard to pick x-values which gave you a good picture of the last graph on page 33? This would have been easier if you had known where the graph crossed the x-axis — in other words, where $f(x) = 0$. We can find the x-values at these points by solving the equation $x^2 + 8x + 7 = 0$.

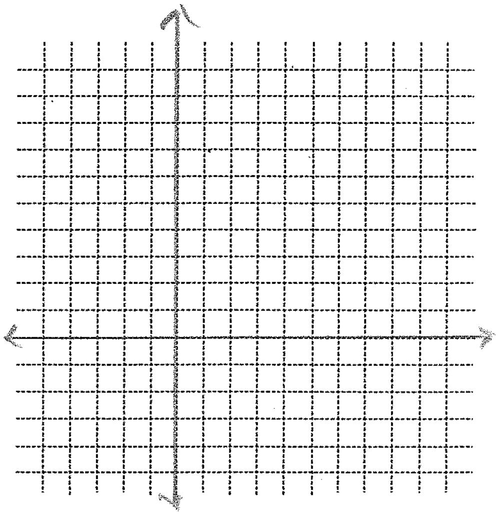
$$f(x) = x^2 + 8x + 7$$
$$0 = x^2 + 8x + 7$$
$$0 = (x+7)(x+1)$$
$$x + 7 = 0 \text{ or } x + 1 = 0$$
$$x = {}^{-}7 \text{ or } x = {}^{-}1$$

This means the graph crosses the x-axis at $({}^{-}7,0)$ and $({}^{-}1,0)$. We would get a good picture of the graph by choosing numbers between $^{-}7$ and $^{-}1$ as the other x-values in our table.

Find the points where the graph of each quadratic function crosses the x-axis. Approximate the x-values if you need to. Then find at least three other points on the curve and draw the graph.

$f(x) = x^2 - 16x + 60$

x	f(x)
	0
	0



$f(x) = x^2 - 6x + 4$

x	f(x)
	0
	0